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Officer Promotion Procedures

An Analysis of Officer Promotion Actions

By

Lonnie D. Valentine, Jr.

Ernest C. Tupes

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PERSONNEL RESEARCH LABORATORY
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Lackland Air Force Base, Texas

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OFFICER PROMOTION PROCEDURES

I. AN ANALYSIS OF OFFICER PROMOTION ACTIONS

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FOREWORD

Under Project 7719, Task 771904, Headquarters USAF has established a requirement with Personnel Research Laboratory for research on problems associated with officer performance evaluation and promotion selection. This report is the first of a series presenting the results of analyses of officer promotion actions and describing experiments with a view to developing procedures which will increase reliability. In this report, the reliability of officer promotions as presently constituted is assessed.

Special acknowledgment is given to the Promotion Board Secretariat, Headquarters USAF, for their assistance, cooperation, and guidance in the design of the studies and the data collection, and their wholehearted support of the research effort. All distribution of this report is controlled by the Secretariat because the information relates to Air Force management policies.

This technical report has been reviewed and is approved.

John Patterson, Col USAF
Commander

A. Carp
Technical Director

ABSTRACT

Data from actions of the FY 1962 Promotion Boards for majors, lieutenant colonels, and colonels were used to estimate reliability of decisions and the relationship of Promotion Scores to Officer Effectiveness Reports (OERs). A series of statistical analyses showed that: (1) the evaluations and resulting recommendations regarding promotion are reliable; (2) from 80 to 90 percent of the decisions would have been concurred in by a hypothetical second board; (3) the nearer an eligible is placed to the selection cutoff score, the greater the likelihood that the promotion decision about him would have been reversed by a second board; and (4) while mean OER is related to Promotion Score, it has been shown that other factors also contribute to this score. An appendix describes the method of estimating reliability of panel scores and board decisions.

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AN ANALYSIS OF OFFICER PROMOTION ACTIONS

I. INTRODUCTION

In August 1962 a series of studies of officer promotion actions were initiated to analyze officer promotion actions from the standpoint of reliability and stability; to devise and carry out analyses and experimental studies leading to possible increases in the effectiveness of the officer promotion system; and to propose those changes which the analyses indicate would feasibly result in increased efficiency. A series of reports of these studies is planned, of which the present report, is the first. Reports immediately forthcoming will discuss the feasibility of using electronic computers to assist Promotion Boards and various ways in which the reliability of promotion board evaluations and officer promotion actions may be increased. Later reports will present the results of studies in which factors such as number of panel members, amount and type of material made available to the panel members, and the method of presentation of this material are systematically varied. Finally, a summary report will bring together the results of the studies and analyses and suggest certain specific changes in the present system which might be tried out by one or more actual Promotion Boards.

This first report describes analyses which were undertaken to assess the consistency with which officer promotion decisions are made. Attention is focused on both the extent to which two or more Promotion Board panels would have made the same decision, and on the consistency with which certain available information about the promotion-eligible officer is used in arriving at a decision about him. Insights gained from analyses of this type may lead to the formulation of board procedures designed to enhance the consistency with which promotion decisions are made.

II. PROMOTION BOARD PROCEDURE

Officer promotion recommendations are made by special boards which are convened at Headquarters USAF. A detailed description of the procedures followed by Promotion Boards is not required here, but a general description is given. An officer Promotion Board is composed of senior Air Force officers drawn from the Air Force at large to serve on the Promotion Board. In advance of the date on which the Board convenes, records of officers to be considered for promotion are assembled at a central point and made ready for the Board's use.

The Board consists of a president, recorders, and a number of three-member promotion panels. The Board is briefed on its mission, Air Force policy with regard to officer promotions to the grade for which the Board is to make selections, and Air-Force-wide trends in officer ratings which may have bearing on the deliberations of the Board.

Following the briefing, all Board members evaluate a sample of the records as a "Trial Run" for training and orientation purposes. "Trial Run" ratings, both for individual Board members and for panels, are posted and discussed with the entire Board. The purpose of the Trial Run is to assist Board members in establishing a "standard" against which they will evaluate officers being considered for promotion. For this reason, the records evaluated during the "Trial Run" have been carefully preselected to cover the range of officer performance. This allows each member of the Board to familiarize himself with the range of performance and background he may encounter in evaluating officer records and to set his standards for various evaluations in light of this information.

Once the Trial Run has been completed, care is exercised to see that officer records are distributed to the Board's panels in a random manner. A record is rated by all three members of the panel to which it is assigned, and a Promotion Score is obtained by summing the three individual ratings. Certain procedures are employed to obtain additional evaluation of records on which there is evidence of considerable disagreement among panel members. Final Board selections are made within panels. Each panel selects its proportionate share of the promotion quota as a safeguard against promotion of officers who were evaluated by an "easy" panel while equally deserving officers evaluated by a "hard" panel are passed over.

III. CONCEPTS OF RATER RELIABILITY

Thus it is readily seen that consistency of evaluations becomes crucial in evaluating the appropriateness of a given Board's promotion decisions. Several different sorts of consistency might be considered in analyzing the evaluations made by a Promotion Board. At one level, one might be concerned with the consistency with which a given panel makes its evaluations — have the "standards" against which the panel's members make their evaluations remained constant? If the same record were evaluated by the panel at two different points in time, would it receive the same evaluation at both times?

At another level, one might be concerned with the extent to which different promotion panels would rank-order eligible officers in the same way. Different panels might be ordering eligible officers in the same way, but applying different score values to them. In this case overall promotion actions agree, but it is probably easier to understand and control a board where the panels are producing similar score distributions.

Since, in the practical situation, one rarely has data that would allow for a direct comparison of ratings across panels, one might ask about the extent to which different panels use information about promotion-eligible officers in a consistent manner in evaluating them. Are those things judged "important" by one panel given equal importance in the evaluations rendered by other panels?

Vanasek¹, in studying the relationships between ratings rendered by different 1957 officer augmentation panels, found that the statistical reliabilities were high and that judgments did not differ significantly between panels. He indicated, however, that since individual lives were closely bound up with each selection resulting from panel judgments it was necessary to investigate the adequacy of different panel judgments in terms of final selections. In effect, he was pointing out that small rating differences near a cutoff score might be statistically nonsignificant but still result in a number of selection differences from one panel to another. He found that, for a group of officers with 5 years of service, from 14 to 23 percent of the selections differed depending upon the panel judging the folders. In the case of a group of officers with 10 years of service, this percentage ranged from 7 to 11.

A series of studies in 1963, examined the reliability (or consistency) of officer Promotion Board actions, and the extent and consistency with which the Mean Officer Effectiveness Rating (Mean OER) is used in arriving at these decisions. Three of these are described in the next sections.

¹ Unpublished manuscript, "Prediction Selection" by F. J. Vanasek, 1958.

IV. RELATIONSHIPS BETWEEN NOMINATING AND PROMOTION SCORES

When two or more raters or rating panels operate with the same frame of reference, one would expect a high relationship among the ratings they assign to a given group of officers. The closer raters are to a common frame of reference with regard to the characteristic being rated, the higher will be agreement among the ratings they assign. This "interrater" agreement is different from "intrarater" agreement, or internal consistency. The latter may be thought of as an index of the extent to which a rater consistently applies his frame of reference, and eliminates "chance" variations from the ratings he assigns.

More often than not, the data available from activities of personnel boards are such that inter-rater agreement must be estimated statistically; rarely are data available which allow for direct comparison of the decisions made by different panels or boards. The only group of officers for whom data of this sort are available are those considered for promotion to temporary colonel each year. Records of eligible lieutenant colonels are reviewed each year by a Nominating Board which then selects a smaller number of the eligibles for consideration by the Temporary Colonel Promotion Board. For officers who were nominated by the FY 62 Colonel Nominating Board, Nominating Board ratings and Promotion Board ratings were compared to gain some idea of the extent to which these different boards agree.

The FY 62 Nominating Board considered records of 2850 lieutenant colonels, and nominated 1200 of them to the Promotion Board. The Nominating Board was composed of 7 three-member rating panels, and the Promotion Board was composed of 4 rating panels.

The 1200 lieutenant colonels nominated to the Promotion Board were divided into 28 subgroups on the basis of the combination of Nominating Board and Promotion Board rating panels rating them (i.e., officers rated by Nominating Board panel 1 and by promotion panel 1 formed one subgroup, etc.). Relationships between Nominating Scores and Promotion Scores were established for each of these subsamples.²

There is considerable variation (from subgroup to subgroup) in the strength of this relationship. This variation may be accounted for in part by the fact that the Promotion Board does not see the records of the lowest scoring individuals, but this can by no means entirely explain the differences. For example, from Table XV it can be seen that those officers selected by nominating panel 1 and later rated by promotion panel 3, and those officers selected by nominating panel 7 and later rated by promotion panel 3 have almost identical dispersion in their ratings; none-the-less, ratings of those officers selected by nominating panel 7 are much more highly related to promotion panel 3 ratings than are nominating panel 1 ratings.

For each of the 1200 officers, the promotion decision that the Nominating Board would have made if it had served as the Promotion Board was determined. These decisions were compared with those that were actually made by the Promotion Board. For each nominating panel separately, Table I shows the extent of agreement between Promotion Board decisions and those that would have been made by that nominating panel. One cannot say with certainty what decision the Promotion Board would have made about those officers not nominated to it by the Nominating Board. Table I suggests that most of them would not have been recommended for promotion; percentage of agreement between the Boards is relatively high, and the further an officer's rating is below the cutoff score, the less likely it is that a promotion decision about him would be reversed by a second board.

² These relationships are presented in Table 15, Appendix I, for readers who wish to see the correlation data.

Table I. Agreement Between Nominating Board and Promotion Board Decisions, FY 62 Temporary Colonels

NOMINATING PANEL	DECISION ^a	PROMOTION BOARD DECISION*		AGREEMENTS	
		0	1	NO.	PERCENT ^b
1	1	27	43	118	70.66
	0	75	22		
2	1	12	61	146	83.43
	0	85	17		
3	1	20	50	132	79.04
	0	82	15		
4	1	23	40	109	72.18
	0	69	19		
5	1	14	59	140	80.00
	0	81	21		
6	1	31	53	149	74.50
	0	96	20		
7	1	9	62	138	81.66
	0	76	22		

*1 = promote; 0 = don't promote.

^bPercent of cases rated by the Promotion Board.

These data, along with data on relationships between the numerical ratings, suggest that, while there is considerable agreement between Boards with regard to promotion decisions, there is considerable disagreement between some specific panels with regard to the numerical ratings. This in turn suggests that the "frame of reference" of some panels differs considerably from that of other panels. These disagreements will result in differences in promotion decisions near a "cutting point"; the panels will tend to agree about promotion or nonpromotion of "high" and "low" cases with greater frequency than for "intermediate" cases.

V. RELIABILITY ESTIMATES OF PROMOTION SCORES

It is possible to estimate statistically the extent to which a second group of raters would agree with an observed set of ratings. The statistical procedures involved assume

Table II. Board-to-Board Reliability,
FY 62 Temporary Majors

Hypothetical Board 2 Scores	BOARD 1 SCORES													TOTAL			
	'5	16	17	18	19	20	21	22	23	24	25	26	27				
30													3	18	12	39	
29													6	23	23	32	94
28													1	7	43	95	238
27													1	18	47	161	440
26													1	10	110	171	817
25													1	8	59	329	1020
24													1	7	40	159	1060
23													6	35	107	228	843
22													4	28	81	124	528
21													3	12	58	93	311
20													2	10	22	60	185
19													2	7	18	27	101
18													4	12	16	11	53
17													7	10	7	3	28
16													5	4	1		10
15													2				2
Total	0	20	35	55	79	194	284	386	662	1462	883	827	579	160	113	30	5769
													$r_{11} = .88$				

that the second group of raters are exactly like the group from whom observed ratings are obtained, and that they render ratings from the same frame of reference. If these assumptions are not met, an over estimate of the extent of agreement is obtained. In essence, these estimates amount to a statistical determination of the extent to which the judgments of the raters in the observed group vary together.³ It should be remembered that while any or all of the raters in the observed group may be rating with perfect internal consistency, the index of agreement reflects only the extent to which their ratings agree with other raters in the group. The estimation technique assumes that variation in ratings which is not related to ratings assigned by other raters is "chance" or random variation.

Evaluation scores from three FY 62 Promotion Boards (Temporary Major, Temporary Lieutenant Colonel, and Temporary Colonel) have been analyzed and their reliabilities (i.e., "agreement") estimated.

The reliabilities were estimated by determining the variance of ratings assigned by each of the three panel members and comparing these values with the variance of the evaluation scores based upon the sum of the three ratings. It has been demonstrated statistically (1, p. 223) that this procedure yields fairly accurate reliability estimates.

In Table II reliability data for the FY 62 Temporary Major Promotion Board are presented; similar data for the FY 62 Temporary Lieutenant Colonel and Temporary Colonel Promotion Boards appear in Tables 3 and 4. The manner in which these estimates were computed, along with panel-by-panel reliability estimates are reported in Appendix II for the benefit of readers interested in more detailed information. The data in each table are presented in the form of a two-way distribution of evaluation scores. The horizontal axis in each table represents the distribution of evaluation scores actually assigned the group of eligible officers by the Promotion Board. The vertical axis represents the distribution of scores expected if another board were to independently evaluate the same records. The values at the bottom of each column indicate the number of officers receiving the Board 1 Promotion Score shown at the top of that column. The figures in each column indicate the distribution of Promotion Scores expected from a second board. For example, looking at Table II (FY 62 Temporary Majors) it can be seen that the Promotion Board assigned an evaluation score of 27 to 579 eligibles. Were a second board to re-evaluate the records of these 579 eligibles, 3 of them would be given a Promotion Score of 30, 23 a score of 29, etc. The other columns and the other tables can be interpreted in the same manner.

It can be seen from these tables that fairly high agreement between boards would be expected with regard to Promotion Scores assigned. Since the score assigned to a record is not so important as the meaning of that score with regard to final promotion decision, the data contained in Tables II, III, and IV have been recast in terms of expected interboard agreement with regard to promotion and presented as Tables V, VI, and VII.

In so reducing the data, a Board 1 "cutoff" score which yields approximately the percentage of promotions made by the board was selected. A cut off for Board 2 (the hypothetical second board) was established by finding that point in the Board 2 distribution which would yield approximately the same promotion ratio as that used for Board 1. Where necessary to obtain the same promotion ratio for Board 2, interpolations into a score interval were made.

It may be seen from Tables V, VI, and VII that two separate boards would be expected to agree on promotion decisions for 84.7 percent of the officers considered for major, for 91.6 percent of the officers considered for lieutenant colonel, and for 79.1 percent of the officers considered for colonel. (These percentages are obtained from the sum of the number of officers "Above Cutoff" on both boards and the number "Below Cutoff" on both boards.)

³ See Appendix II for an explanation of the method.

Table III. Board-to-Board Reliability,
FY 62 Temporary Lt Colonels

BOARD 1 SCORES															TOTAL		
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
30											7	16	14	20	58		
29										1	8	38	49	24	13	133	
28									2	12	48	128	87	23	7	307	
27								1	23	71	148	218	83	12	2	558	
26							2	12	116	206	240	197	41	4		818	
25						2	13	56	321	305	197	87	11			292	
24			1	2	15	58	142	428	234	84	22					986	
23			4	11	64	138	190	322	95	22	3					849	
22			1	18	45	139	154	128	121	19	1					526	
21		1	8	48	95	160	118	43	23	2						498	
20	1	5	29	76	100	96	35	8	2							352	
19	4	16	52	76	54	28	6	1								237	
18	2	12	29	47	48	19	6	1								164	
17	4	20	25	24	18	3	1									95	
16	7	17	12	6	4											46	
15	8	9	3	1	1											22	
Total	21	63	91	168	294	329	511	525	581	1358	945	749	700	287	77	42	6741
																	$r_{II} = .90$

Table IV. Board-to-Board Reliability,
FY 62 Temporary Colonels

BOARD 1 SCORES															TOTAL		
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
30												1	1			2	
29										2	6	5	1	1		15	
28									1	5	10	15	9	2	1		43
27								1	5	16	28	30	11	1			92
26							2	7	21	41	46	32	8	1			158
25						2	8	24	46	57	43	21	4				205
24					1	6	17	44	60	50	25	7	1				211
23				1	4	15	44	51	52	26	8	2					203
22				2	8	23	42	35	14	7	2						133
21			1	3	11	21	18	14	5	1							74
20			1	5	8	11	8	3	1								37
19			1	3	4	4	2										14
18			1	1	1												3
17																	0
16																	0
15																	0
Total	0	0	0	3	15	37	83	141	179	205	203	164	113	39	6	2	1190
																	$r_{II} = .77$

*Table V. Board-to-Board Selection Comparison,
FY 62 Temporary Majors*

BOARD 2	BOARD 1					
	BELOW CUTOFF		ABOVE CUTOFF		TOTAL	
	N	PERCENT	N	PERCENT	N	PERCENT
Above cutoff	442	7.7	3614	62.6	4056	70.3
Below cutoff	1273	22.1	440	7.6	1713	29.7
Total	1715	29.8	4054	70.2	5769	100.0

*Table VI. Board-to-Board Selection Comparison,
FY 62 Temporary Lt Colonels*

BOARD 2	BOARD 1					
	BELOW CUTOFF		ABOVE CUTOFF		TOTAL	
	N	PERCENT	N	PERCENT	N	PERCENT
Above cutoff	281	4.2	4983	73.9	5264	78.1
Below cutoff	1196	17.7	281	4.2	1477	21.9
Total	1477	21.9	5264	78.1	6741	100.0

*Table VII. Board-to-Board Selection Comparison,
FY 62 Temporary Colonels*

BOARD 2	BOARD 1					
	BELOW CUTOFF		ABOVE CUTOFF		TOTAL	
	N	PERCENT	N	PERCENT	N	PERCENT
Above cutoff	124	10.4	402	33.8	526	44.2
Below cutoff	539	45.3	125	10.5	664	55.8
Total	663	55.7	527	44.3	1190	100.0

Some idea of the cases on which separate boards would be most likely to disagree can be obtained by expanding the data in Tables V, VI, and VII such that a distribution of Promotion Scores from the actual board (Board 1) against expected promotion selections by the hypothetical second board (Board 2) may be inspected. These data are shown in Tables VIII, IX, and X.

It can be seen from these tables that the nearer the cutoff score a ratee's Promotion Score places him, the less reliable (or consistent) is the promotion decision about him; and the more likely it is that a second board would have arrived at the opposite decision about him. For example, chances are about 1 in 2 (48.8%) that a captain who was passed over with

a score of 23 (just below the cutoff) by the FY 62 Majors Board would have been selected had the records been considered by a second board; these probabilities drop off as the score assigned by the Board gets lower, so that chances are only about 2 in 100 that a captain passed over with a score of 20 by the Board would have been promoted by a second board.

VI. RELATIONSHIP BETWEEN MEAN OER AND PROMOTION SCORE

Past studies (2, 3) have indicated that an officer's Mean Effectiveness Rating (Mean OER) is more highly related to personnel board decisions about him than is any other available measure. It was hypothesized that, in assigning promotion ratings, the rater gains an impression of the mean OER from inspection of the individual OERs for officers who are quite high or low on this variable;⁴ but that a number of variables are taken into consideration for officers with intermediate level Mean OERs in an effort to evaluate them "fairly."

Stated differently, one would expect raters to feel that only quickly obvious major attributes or deficiencies would alter final promotion decisions about officers whose effectiveness ratings have been consistently high or low; on the other hand, officers who have performed at an intermediate level may well have a promotion decision reversed by consideration of special or unusual accomplishments, abilities, or training. The purpose of this analysis is to determine the extent of relationship between Promotion Scores and Mean OERs, and to examine the nature of that relationship.

For each of the FY 62 Promotion Boards (Major, Lieutenant Colonel, and Colonel) separately, and for the FY 62 Colonels Nominating Board, officers considered by the board were divided into subgroups based on Mean OER intervals. For each of these subgroups, the mean and standard deviation of the Promotion Score was computed. In addition, the correlation between Mean OER and Promotion Score was computed for each of the four boards. These data are shown in Tables XI, XII, XIII, and XIV.

If the hypothesis under consideration is tenable, one would expect the relationship between Promotion Score and Mean OER to assume a form in which Mean Promotion Score within successively lower Mean OER intervals drops off in a fairly linear manner (i.e., decreases fairly uniformly); moreover, one would expect the Promotion Score standard deviation (which is a measure of variability) to be smaller in the high and low Mean OER intervals than in the intermediate intervals.

It appears that the relationship between Mean OER and Promotion Score is linear. (For the Temporary Colonel Promotion Board the mean Promotion Score is higher in the lowest Mean OER interval than in the next higher interval, but this mean is based on only two cases.) However, there is little evidence for greater Promotion Score difference in the middle Mean OER intervals than at the extremes, except for the Colonels Nominating Board. It may be that the Nominating Board's ratings tend to conform to the hypothesis regarding Mean OER and Promotion Score relationships because the Nominating Board members assume that the Promotion Board will wish to examine all high Mean OER folders but will not wish to examine low Mean OER folders. In this sense, the task assumed by the Nominating Board might be regarded as different from that of the Promotion Board.

For the Lieutenant Colonel Promotion Board there is some increase in Promotion Score difference from the highest Mean OER interval to the lower intervals; and for the Major

⁴The Mean OER itself is never available to Promotion Board members.

Table VIII. Distribution of Board-to-Board Selection Disagreements.^a
FY 62 Temporary Majors

BOARD 1 SCORES	BOARD 2 SCORES			% DIS- AGREE- MENTS ^b	% DISTR OF DISAGREE- MENTS ^c
	ABOVE CUTOFF	BETWEEN CUTOFF	TOTAL		
30	30	1	30		
29	113	1	113		
28	160	1	160		
27	578	1	579	.2	.1
26	814	13	827	1.6	1.5
25	815	68	883	7.7	7.7
24	1104	358	1462	24.5	40.6
23	323	339	662	48.8	36.6
22	93	293	386	24.1	10.5
21	22	262	284	7.8	2.5
20	4	190	194	2.1	.5
19	1	79	79		
18	1	55	55		
17	1	35	35		
16	1	20	20		
15	1	1	1		
Total	4056	1713	5769	15.3	100.0

^a"Disagreement" entries appear in italics.

^bPercent of cases in the Board 1 score interval on whom promotion "disagreement" occurs.

^cPercentage distribution on Board 1 score of "disagreement" cases.

Table IX. Distribution of Board-to-Board Selection Disagreements.^a
FY 62 Temporary Lt Colonels

BOARD 1 SCORES	BOARD 2 SCORES			% DIS- AGREE- MENTS ^b	% DISTR OF DISAGREE- MENTS ^c
	ABOVE CUTOFF	BETWEEN CUTOFF	TOTAL		
30	42	1	42		
29	77	1	77		
28	287	1	287		
27	700	1	700		
26	749	1	749		
25	941	1	945	.4	.7
24	1321	37	1358	2.7	6.6
23	516	65	581	11.2	11.6
22	350	175	525	33.3	31.1
21	206	1	305	40.3	36.7
20	53	276	329	16.1	9.4
19	21	273	294	7.1	3.7
18	1	167	168	.6	.2
17	1	91	91		
16	1	63	63		
15	1	21	21		
Total	5264	1477	6741	8.4	100.0

^a"Disagreement" entries appear in italics.

^bPercent of cases in the Board 1 score interval on whom promotion "disagreement" occurs.

^cPercentage distribution on Board 1 score of "disagreement" cases.

Table X. Distribution of Board-to-Board Selection Disagreements,^a
FY 62 Temporary Colonels

BOARD 1 SCORES	BOARD 2 SCORES		TOTAL	% DIS- AGREE- MENTS ^b	% DISTR OF DISAGREE- MENTS ^c
	ABOVE CUTOFF	BETWEEN CUTOFF			
30	2	1	2		
29	6		6		
28	<i>38</i>	1	<i>39</i>	2.6	.4
27	<i>104</i>	9	<i>113</i>	8.0	3.6
26	<i>130</i>	34	<i>164</i>	20.7	13.7
25	<i>122</i>	81	<i>203</i>	39.9	32.5
24	<i>76</i>	129	<i>205</i>	37.1	30.5
23	<i>35</i>	144	<i>179</i>	19.6	14.1
22	<i>11</i>	130	<i>141</i>	7.8	4.4
21	<i>2</i>	81	<i>83</i>	2.4	.8
20		37	37		
19		15	15		
18		3	3		
17					
16					
15					
Total	526	664	1190	20.9	100.0

^a"Disagreement" entries appear in *italics*.

^bPercent of cases in the Board 1 score interval on whom promotion "disagreement" occurs.

^cPercentage distribution on Board 1 score of "disagreement" cases.

Table XI. Relationship Between Mean OER and Promotion
Score for Officers Considered for
Promotion to Major

MEAN OER INTERVAL	N	PROMOTION SCORE	
		MEAN	SD
8.5 - 9.0	40	27.70	1.75
7.5 - 8.4	1304	25.97	1.64
6.5 - 7.4	2623	24.00	1.51
5.5 - 6.4	1765	22.20	1.74
4.5 - 5.4	347	19.73	1.94
3.5 - 4.4	37	18.05	2.46
2.5 - 3.4	1	16.00	0.00
<i>r</i> = .69			

Promotion Board, Promotion Score dispersion decreases from the highest Mean OER interval to the intermediate intervals and then begins to increase again.

Relationships between Mean OERs and Promotion Scores are moderately high; correlation for the Colonels Promotion Board is considerably less than for the other boards. This lower correlation can be explained in part by the restriction in range of performance produced by the Nominating Board's screening of eligible officers.

Table XII. Relationship Between Mean OER and Promotion Score for Officers Considered for Promotion to Lt Colonel

MEAN OER INTERVAL	N	PROMOTION SCORE	
		MEAN	SD
8.5 - 9.0	130	26.51	2.03
7.5 - 8.4	2347	25.43	1.93
6.5 - 7.4	2783	23.50	2.21
5.5 - 6.4	945	21.43	2.37
4.5 - 5.4	136	19.11	2.50
3.5 - 4.4	11	17.09	2.43
$r = .64$			

Table XIII. Relationship Between Mean OER and Nominating Score for Officers Screened for Promotion to Colonel

MEAN OER INTERVAL	N	NOMINATING SCORE	
		MEAN	SD
8.5 - 9.0	31	26.45	1.48
7.5 - 8.4	1325	24.16	2.23
6.5 - 7.4	1232	21.83	2.54
5.5 - 6.4	205	18.57	2.57
4.5 - 5.4	20	16.25	1.76
3.5 - 4.4	1	15.00	0.00
$r = .65$			

Table XIV. Relationship Between Mean OER and Promotion Score for Officers Considered for Promotion to Colonel

MEAN OER INTERVAL	N	PROMOTION SCORE	
		MEAN	SD
8.5 - 9.0	30	26.17	1.95
7.5 - 8.4	906	24.35	2.07
6.5 - 7.4	270	23.20	2.02
5.5 - 6.4	2	23.50	1.50
$r = .36$			

Relationships between Promotion Scores and Mean OERs are somewhat lower than the reliabilities of the Promotion Scores. This might be interpreted as meaning that a sort of averaging of effectiveness ratings does not entirely account for the reliable (or consistent) part of Promotion Scores. It may be that the different OERs are given differential weight in arriving at a rating, or that some non-OER data are considered in a systematic way in arriving at a promotion rating.

Data reported here also suggest that these additional considerations (whether differential weighting of OERs or non-OER factors) are probably considered systematically for all eligible officers regardless of average level of performance in arriving at a promotion rating.

VII. CONCLUSIONS

The foregoing analyses have indicated that Promotion Board evaluation scores and the resulting recommendations regarding promotion are reasonably reliable and compare favorably in reliability with other types of ratings. Analysis of Promotion Score reliabilities was approached in two different ways.

First, promotion selections based on colonels' Nominating Scores were compared with the selections actually made later by the Promotion Board. From this analysis, it was found that the two boards would have agreed on their promotion decision for 71 to 83 percent of the officers considered. There was some evidence that the Nominating Board may have perceived its job as being somewhat different from that of the later Promotion Board; it is likely that the two boards would have agreed on a higher percentage of these decisions had that not been so.

Secondly, an analysis was made of the extent to which panel members within a single board agree with each other, and these analyses were used as a basis for estimates of the extent to which different boards with the same frame of reference would agree with each other. This analysis indicated that from 79 to 92 percent of the promotion decisions made by the boards would have been concurred in by a hypothetical second board.

Further analysis was made of the expected board-to-board disagreements and it was found that they are concentrated in the vicinity of the selection cutoff score; the nearer to the cutoff score a ratee is placed by the board evaluation, the greater the likelihood that the promotion decision about him would be reversed by a second board.

It is further suggested that data other than an average of OERs are considered by Promotion Boards in arriving at their ratings, and that these as yet undefined additional considerations are used with some universality by raters.

It is obvious from the present analyses that little improvement can be made in the consistency with which promotion decisions regarding outstanding or extremely poor officers are made; if Promotion Board procedures are improved upon with regard to consistency with which promotion decisions are made, efforts at improvement must be concentrated on evaluation of "average" officers; it is in this range of Air Force officer performance that distinctions in the respective merits of officers are more difficult to make, and proximity of the officer's evaluated potential for promotion to promotion cutoff increases the likelihood that chance factors may influence his selection or nonselection for promotion.

Present plans call for analysis of relationships of certain promotion folder data to Promotion Scores and study of the feasibility of use of predictions based on these relationships as an aid in monitoring promotion decisions so that officers about whom there is greatest likelihood of an "inconsistent" or unreliable decision may be identified in advance and brought to the attention of the board for particularly careful evaluation.

APPENDIX I. RELATIONSHIP BETWEEN NOMINATING AND PROMOTION SCORES

Table XV gives the correlations between Nominating and Promotion Scores for officers considered by the FY 62 Colonels Promotion Board. Correlations are given for each combination of Nominating and promotion panels, along with means and standard deviations for the two variables.

Table XV. Within-Panels Correlations Between Nominating Scores (NS) and Promotion Scores (PS), for FY 62 Colonel Boards

NOMINATING PANEL	PROMOTION PANEL							
	1		2		3		4	
	NS	PS	NS	PS	NS	PS	NS	PS
1	r	.64		.35		.33		.67
	n	38		68		38		23
	M	25.53	23.56	25.16	24.53	25.39	23.82	25.22
	SD	1.23	2.67	1.12	1.91	1.20	1.78	1.25
2	r	.72		.23		.55		.58
	n	17		42		60		56
	M	25.65	24.00	24.79	24.69	25.00	24.00	25.25
	SD	1.41	2.95	.96	1.71	1.00	1.90	1.23
3	r	.36		.38		.41		.47
	n	28		44		62		33
	M	23.82	22.93	24.39	24.91	23.98	23.97	24.39
	SD	1.10	2.17	1.35	1.84	1.13	1.75	1.25
4	r	.53		.47		.65		.43
	n	19		46		18		68
	M	25.47	24.47	25.39	24.89	25.06	24.11	25.38
	SD	1.09	2.62	1.22	2.02	1.03	1.49	1.06
5	r	.64		.65		.61		.30
	n	58		53		43		21
	M	25.21	23.79	25.38	24.68	25.05	24.28	25.33
	SD	1.11	2.80	1.29	2.01	1.06	1.83	1.21
6	r	.46		.50		.50		.35
	n	40		61		59		40
	M	25.52	23.45	25.66	24.54	25.59	24.47	25.68
	SD	1.07	2.21	1.11	1.91	1.09	1.65	1.08
7	r	.46		.63		.73		.63
	n	39		16		56		58
	M	25.00	23.51	25.25	25.56	25.41	24.45	25.17
	SD	1.11	2.85	1.20	1.54	1.21	1.78	1.16

APPENDIX II. METHODS OF DERIVING RELIABILITY ESTIMATES

Estimating Reliability of Promotion Scores

Promotion Scores are obtained by adding together the three independent ratings made by the panel members after examination of the selection folder. Each rating can range from 5 to 10 and the evaluation scores from 15 to 30.

The reliability of a score based upon the sum of a number of other scores can be estimated by the Kuder-Richardson formula 20. This is an internal consistency reliability estimate and essentially estimates the extent to which the score would correlate with another score obtained in exactly the same way. In the present case, the reliability coefficient is an estimate of the correlation between the evaluation score based on the three panel-member ratings and another evaluation score based on three more panel-member ratings.

The formula used in estimating the reliabilities, which is analogous to the Kuder-Richardson formula 20, is:

$$r_{ii} = \left(\frac{n}{n-1} \right) \left(1 - \frac{\sum \sigma_i^2}{\sigma_s^2} \right)$$

where: r_{ii} = the reliability coefficient

i = any panel-member's rating

s = evaluation score

n = number of members per panel = 3

σ_s^2 = variance (squared deviation) of the evaluation scores

$\sum \sigma_i^2$ = sum of the variances of the three panel-member's ratings

Since cutting scores for promotion recommendations are established separately for each panel, reliability estimates were computed panel by panel and then averaged to insure that board reliability estimates would be realistic. To cancel out any possible effect of practice or boredom on the reliability estimates, four reliability coefficients (one based on 30 cases rated early in the cycle, a second based on 30 rated toward the middle, the third based on 30 rated after the middle, and the fourth based on 30 rated near the end) were computed for each panel and averaged to obtain the panel reliability estimates.

This resulted in reliability estimates which were based on a total of approximately 840 cases for the Majors Board, 700 cases for the Lieutenant Colonels Board, and 480 cases for the Colonels Board.

The panel-by-panel reliability estimates, along with the panel means and variances, are presented in Tables XVI, XVIⁱ, and XVIII. These tables are of interest, since they provide indications of panel differences and may be examined for trends if desired. It might be expected, for example, that reliabilities of early ratings (because of lack of practice) and of late ratings (because of boredom) would be lower than the others. No such tendencies are apparent.

Constructing Board-to-Board Reliability Tables

As noted earlier, the reliability estimates may be regarded as estimates of the correlation between the Promotion Scores of a Promotion Board and the Promotion Scores which would result were another equivalent board to re-evaluate the same eligible officers. Thus the reliability coefficient can be used as a correlation coefficient to develop a regression equation to predict the Promotion Scores of the second board from those of the first board. The mean and standard

**Table XVI. Panel Means, Variances, and Reliability
Estimates for FY 62 Temporary Majors Board**

(*N* = 30 cases per page)

PANEL	ROSTER PAGE	M	σ^2	r_{II}
1	1	23.6	2.2	.744
1	42	23.9	5.2	.940
1	114	24.3	6.2	.908
1	167	23.9	9.5	.940
				Average .897
2	2	24.9	3.2	.880
2	47	25.1	5.3	.866
2	113	24.4	5.6	.882
2	168	24.6	2.8	.741
				Average .851
3	3	23.9	3.4	.962
3	46	24.0	3.6	.861
3	115	23.2	10.2	.912
3	169	22.7	4.5	.910
				Average .889
4	4	22.8	5.7	.914
4	44	22.7	3.3	.740
4	111	22.8	5.9	.816
4	166	22.8	7.6	.904
				Average .856
5	5	22.8	4.5	.753
5	43	22.6	5.1	.905
5	110	22.9	5.3	.892
5	171	22.5	5.8	.882
				Average .869
6	6	24.0	8.2	.940
6	41	24.4	6.8	.882
6	109	23.6	7.1	.860
6	173	23.5	4.6	.837
				Average .886
7	7	21.6	3.9	.846
7	45	22.3	6.1	.927
7	112	23.2	8.2	.951
7	172	24.2	3.1	.876
				Average .907

*Table XVII. Panel Means, Variances, and Reliability
Estimates for FY 62 Temporary Lt Colonels Board*

(*N = 30 cases per page*)

PANEL	ROSTER PAGE	M	σ^2	r_{11}
1	1	23.6	4.9	.873
1	72	25.3	5.1	.870
1	151	23.2	7.9	.938
1	239	23.2	8.0	.942
			Average	.906
2	2	21.3	3.8	.807
2	70	23.4	7.8	.880
2	148	24.0	6.4	.914
2	222	23.8	4.4	.897
			Average	.875
3	3	23.6	5.6	.831
3	223	22.2	5.4	.879
			Average	.855
4	4	25.6	7.6	.904
4	74	23.7	9.3	.872
4	149	24.5	6.5	.902
4	221	24.0	8.4	.932
			Average	.902
5	5	23.6	5.4	.890
5	68	23.8	7.7	.876
5	146	23.5	11.2	.939
5	220	25.3	4.5	.840
			Average	.886
6	6	25.0	5.6	.900
6	75	23.9	4.4	.862
6	152	23.2	7.9	.938
6	217	23.4	13.7	.954
			Average	.914
7	7	23.5	6.8	.894
7	73	24.8	6.6	.910
7	150	23.8	6.1	.912
7	218	21.8	7.5	.910
			Average	.904

*Table XVIII. Panel Means, Variances, and Reliability
Estimates for FY 62 Temporary Colonels Board*

(*N* = 30 cases per page)

PANEL	ROSTER PAGE	MEAN	σ^2	r_{11}
1	1	23.4	7.4	.806
1	14	23.4	6.4	.834
1	25	24.7	7.8	.881
1	34	23.0	6.3	.756
		Average		.825
2	2	25.3	4.7	.837
2	17	24.7	3.4	.763
?	26	24.1	2.6	.692
2	40	24.1	5.0	.840
		Average		.790
3	3	23.8	4.0	.824
3	15	24.2	2.3	.648
3	28	23.9	3.2	.631
3	37	25.3	3.2	.753
		Average		.725
4	4	24.4	4.6	.741
4	16	23.8	5.1	.760
4	27	24.2	5.3	.806
4	38	24.8	3.8	.678
		Average		.749

deviation of the second board scores are assumed to be the same as the mean and standard deviation of the first board scores. Such an equation was developed for each of the three Promotion Boards, resulting in the following:

FY 62 Majors: Board 2 Score = .88 times Board 1 Score + 2.84

FY 62 Lt Cols: Board 2 Score = .90 times Board 1 Score + 2.39

FY 62 Colonels: Board 2 Score = .77 times Board 1 Score + 5.54

Since the correlations between Board 1 and Board 2 are less than 1.00, for each Board 1 Score, there will be a distribution of Board 2 scores. This distribution will have a mean equal to the predicted Board 2 Score and a standard deviation equal to the standard error of estimating Board 2 from Board 1. These standard errors of estimate are respectively, 1.14, 1.18, and 1.34, for the Majors, Lieutenant Colonels, and Colonels Boards.

To develop the reliability tables (Tables 2, 3, and 4), for each Board 1 (Promotion Board) score, the corresponding Board 2 score was predicted. The differences between this predicted score and the various possible whole number Board 2 scores were then obtained by subtraction. (Since a score of 27 is assumed to cover the range between 26.5 and 27.5, the 26.5 was used in obtaining the difference and similarly for other scores.) Each difference was then divided by

the standard error of estimate and the results used to enter the normal probability table to obtain the proportion of cases expected to have a difference score of that magnitude. The number of cases having each Board 1 Score was then multiplied by the appropriate proportions to obtain the expected distribution of Board 2 Scores. In this way the various columns of the table were developed. It should of course be noted that the column values are expected values and thus only estimates of the column distributions that would be obtained were another board actually to re-evaluate the eligibles.

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13. ABSTRACT Data from actions of the FY 1962 Promotion Boards for majors, lieutenant colonels, and colonels were used to estimate reliability of decisions and the relationship of Promotion Scores to Officer Effectiveness Reports (OERs). A series of statistical analyses showed that: (1) the evaluations and resulting recommendations regarding promotion are reliable; (2) from 80 to 90 percent of the decisions would have been concurred in by a hypothetical second board; (3) the nearer an eligible is placed to the selection cutoff score, the greater the likelihood that the promotion decision about him would have been reversed by a second board; and (4) while mean OER is related to Promotion Score, it has been shown that other factors also contributed to this score. An appendix describes the method of estimating reliability of panel scores and board decisions.		

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